**EPA comments to the Groundwater and Surface Water Data Summary Report**
**Columbia Falls Aluminum Company**
**Columbia Falls, Montana**
**Prepared for Columbia Falls Aluminum Company, LLC by Roux Associates, Inc.**
**Dated November 27, 2017**

## General Comments

Overall, the Groundwater and Surface Water Data Summary Report (GW-SW Report) is well written and comprehensive. The data collected during the first year of water sampling provides a good picture of the hydraulic characteristics, temporal variations in groundwater occurrence, contaminant distribution and seasonal variations in groundwater and surface water concentrations.

The slug test data should be presented visually on a site plan to better evaluate potential preferential pathways. One figure for each hydrogeologic unit showing the data, possibly like the thematic dot maps, should be generated.

## Specific Comments

Section 2.1 (Page 4, bullet list) – Please use the name of the stratigraphic unit at the beginning of each description. For example, bullet 1 would state:

- Glacial Outwash and Alluvium: A layer of glaciofluvial and alluvial…

Section 2.2 (Page 6, 1st paragraph, 3rd and 4th sentences) –Please present more lines of evidence (i.e. hydraulic gradients, flow direction, contaminant transport, geochemistry, etc) to reinforce the continuity of the upper hydrogeologic unit in this discussion.

Section 2.2 (Page 6, 3rd paragraph, 3rd sentence) – Please add to this discussion the slug test data that support the assertion that the till deposits have lower hydraulic conductivity than the overlying outwash deposits.

Section 3.9 (Page 22) – Please add to this discussion the results of the waste characterization samples.

Section 4.1 (Page 24, Table of Average Groundwater Elevations) – Please discuss the significance of the table in the text. What value does the table add to the discussion?

Section 4.1 (Pages 26-27, Table of Nested Well Groundwater Elevations; 1st paragraph on page 27) – Please calculate vertical gradients for these nested wells and discuss the magnitude of the downward gradients. Also, please explain why the groundwater elevations (GWE) for the CFMW-016/CFMW-016a well pair are not presented.

Section 4.2 (Page 28, 2nd paragraph; Appendix B) – Please explain the anomalous 'flatline' visible on the CFMW-016 hydrograph from approximately 8/2017 to 10/2017. Was there a technical issue with the transducer? There are no manual GWE measurements shown during the indicated period to compare with.

Section 4.2 (Page 28, 3rd paragraph; Appendix B) – The assertions made in this paragraph, specifically that GWE fluctuations recorded in the deeper wells (screened below the upper hydrogeologic unit) were gradual, did not respond to precipitation events like the upper hydrogeologic unit wells, and that they support that the units are not in hydraulic communication is not supported by the hydrographs for wells CFMW-016/CFMW-016a which show similar GWE behavior. Please discuss this in the text. Also, please revise the final sentence of the paragraph as such: "The slower, gradual responses observed in well pairs CFMW-053/053a and CFMW-019/019a further suggests limited connectivity between the deeper unit and the upper hydrogeologic units proximal to these well pairs."

Section 4.3.2.1 (Page 32, bullet list, 2nd bullet) – Please present the percentages of samples where cyanide concentrations exceeded DEQ-7/USEPA MCLs.

Section 4.3.2.2 (Page 34, bullet list, 1st bullet on page, last sentence) – Please move this sentence to the discussion in Section 8.

Section 4.3.2.2 (Page 34, bullet list, 2nd bullet on page, 3rd sentence) – As above, please move the statement that fluoride concentrations in groundwater are similar to concentrations measured in public and community water supply wells to the discussion in Section 8.

Section 4.3.2.3 (Page 35, bullet list, 4th bullet, 3rd sentence) – Please clarify if the highest concentrations of aluminum, arsenic, cobalt, iron, and lead are found in the same wells as the elevated fluoride and cyanide downgradient of the West Landfill and Wet Scrubber Sludge Pond. Also, as a global comment, please refer to the 'water table monitoring wells' as 'monitoring wells screened in the upper hydrogeologic unit' for consistency.

Section 4.3.2.3 (Page 35, bullet list, 6th bullet, last sentence) – Please revise this sentence to state: "In (x) of (x) samples where total zinc was detected, dissolved zinc was below detection limits."

Section 4.4 (Page 37, 2nd paragraph, last sentence; Plates 7 and 10) - This statement is not supported by the Plates. Please refine the statement to discuss spatial variability in the temporal data, or remove this from the text.

Section 4.5 (Page 38, 1st partial paragraph, last sentence) –Please state the rationale for using the two different analysis packages.

Section 4.5.2 (Page 39) – Please generate a series of figures presenting the slug test results for the two hydrogeologic units on a site plan, perhaps as thematic dot maps. This may illuminate preferential pathways and enhance the understanding of contaminant distribution and transport at the Site.

Section 4.5.2 (Pages 39, 1st paragraph, last sentence; Table 18) – Please replace the average hydraulic conductivity on Table 18 with the geometric mean hydraulic conductivity. Please carry this revision into the text throughout the section.

Section 4.5.2 (Pages 40-41, Table of Hydraulic Conductivity) – As above and in Table 18, please use the geometric mean hydraulic conductivity in place of the average hydraulic conductivity.

Section 5.3 (Pages 45-51; Appendix M) – Please show **all** of the screening levels used in the evaluation of COPCs on the thematic dot maps in Appendix M, and ensure that the color coding of concentration ranges is concurrent with the criteria used.

Section 5.3.3 (Page 50, bullet list, 2nd bullet on page) – Please discuss the zinc exceedances of the DEQ-7 Acute Aquatic Life Standards.

Section 5.4 (Page 52) – Please revise the final statements of this section. The thematic dot maps in Appendix M do show some temporal variability in concentration, albeit minor.

Section 8.2.1 (Page 65, last paragraph) - Please add to this section a discussion of variability of concentrations just west of the Main Plant Area, south of the West Landfill, Wet Scrubber Pond and percolation ponds. For example, on Plate 7, June 2017, concentration of cyanide in wells CFMW-031 and CFMW-033 (104 and 181 ug/L, respectively) are directly upgradient of higher concentrations (i.e., CFMW-043 at 535 ug/L).

Section 8.2.2 (Page 65, 1st paragraph, last sentence) - Please present additional lines of evidence to support the assertion that groundwater is the source of the cyanide detected in the Backwater Seep Sampling Area.

Section 8.2.2 (Page 66, 1st partial paragraph on page, 2nd sentence) - Please expand the discussion of how entrained sediment may have contributed to cyanide in the Cedar Creek sample.

Section 8.3.1 (Pages 66-67; Plates 7 and 10) - Please see comments regarding spatial distribution above for Section 8.2.1, and for isoconcentration contours on Plates 7 and 10. Please revise the concentration contour figures, create hydraulic conductivity distribution figures per comments on Section 4.5.2, and revise this section using the revised and new figures.

Table 18 – Please replace the average hydraulic conductivity on Table 18 with the geometric mean hydraulic conductivity.

Plate 7 - Please revise September 2016 and June 2017 contours to account for lower concentration wells within the boundaries of higher concentration isolines. For example, on June 2017 figure CFMW-031 (104 ug/L), CFMW-042 (395 ug/L), CFMS-033 (181 ug/L), CFMW-029 (128 ug/L) are within the 400 ug/L contour; CFMW-044 (69.5 ug/L) and CFMW-034 (287 ug/L) are within the 300 ug/L contour.

Plate 10 - Please revise September 2016, December 2016, and June 2017 contours to account for lower concentration wells within the boundaries of higher concentration isolines. For example, on the December 2016 figure, the 3,000 ug/L contour should go between wells CFMW-021 (3120 ug/L) and CFMW-019 (2890 ug/L), and on the June 2017 figure the 5,000 ug/L line should encompass CFMW-027 (5160 ug/L).